OCCURRENCE OF *SMINTHOPSIS VIRGINIAE VIRGINIAE* (TARRAGON, 1827) AND *RATTUS LEUCOPUS COOKTOWNENSIS* (TATE, 1951) IN NORTH QUEENSLAND SUGARCANE AREAS. *Memoirs of the Queensland Museum 49(2): 761-762. 2004*:- Small mammal research in coastal North Queensland since the 1940s has concentrated on the control of *Rattus sordidus* (Gould, 1858) and *Melomys burtoni* (Ramsay, 1887) as agricultural pests in sugarcane. Redhead (1973), Hitchcock (1973), Wilson & Whisson (1993) and Story (1990, 1993a, 1993b) examined rodent populations and formulated management strategies. In particular, Wilson & Whisson (1993) and Wbisson (1996) demonstrated that non-rodenticidal methodologies can be successful in reducing population numbers. None of these studies, bowever, have investigated the utilisation of sugarcane crops by other non-target small mammal species or quantified the effects of rodenticides on such species.

Sminthopsis virginiae virginiae (Tarragon 1827), the red-cheeked dunnart, is seldom seen in sugarcane. Redhead (pers. comm.) recorded one specimen in the Abergowrie region, Herbert River district (18°28'S 145°50' E) in 1972 . The specimen was trapped in sugarcane adjacent to open sclerophyll forest with an understorey dominated by blady grass (*Imperata cylindrica*), spear grass (*Heteropogon contortus*) and kangaroo grass (*Themeda triandra*).

This paper documents *S. virginiae virginiae* and *R. leucopus cooktownensis* in sugarcane in the Herbert Valley and Tully cane growing regions of north Queensland.

Herbert Valley

Elliott Type A small mammal traps baited with cardboard squares soaked in linseed oil were set in a 40 trap grid (4 cane rows of 10 traps each with each trap 10m apart) within a cane field in the Lannercost area of the Herbert Valley (18°33'S 146°01'E). Head-body, tail, hind foot and ear measurements, sex and body weight were recorded. Individual animals were processed and released at the point of capture.

Weed biomass was assessed at each site where *R. leucopus cooktownensis and S. virginiae virginiae* were collected. Five sampling points distributed throughout the cane field were allocated a biomass rating of 0, 1, 2, 3 or 4 corresponding to percentage green cover expressed as 0, 1-25, 26-50, 51-75 and 76-100% respectively. A mean weed index was calculated for each site as the average of the value for the 5 sampling points.

Tully

Elliott Type A live traps baited with a mixture of peanut butter, rolled oats and vanilla essence were used. Eight lines of 6 Elliott traps, 10m apart, and bordered by 6 cage traps, were laid in the Euramo area (18°01'S 145°52'E). Sex class classification and weed biomass sampling was as in the Herbert Valley. Animals were processed and released at the point of capture.

Results

In the Herbert Valley, Nov. 1993-June 1994, 5 *S. virgineae* were captured ; they had body lenghts 93-118mm,tail lengths 84-105mm and weights38-64 g. 2 more were captured during the Tully trials Aug-Dec. 1994.

During 2 trappings in August and October 1994 in the Tully region, 11 and 18 *R. leucopus* were captured with head-body length 113-162mm, tail length 113-155mm and weight 62-210gm.

R leucopus cooktownensis were caught in cane fields devoid of in-crop weeds (Table 1). These cane fields had low populations of *R. sordidus*, probably due to low weed levels (Wilson & Whisson, 1993).

Discussion

R. sordidus and *M. burtoni* are common in sugarcane and their ability to quickly colonise cane fields and establish territories probably allows them to exclude less fecund species. *R. sordidus and M. burtoni* are strongly "r" selected (MacArthur & Wilson, 1967) exhibiting high fecundity and colonisation rates. *S. virginiae virginiae* and *R. leucopus* have lower fecundity, are less strongly selected for "r" characteristics and therefore it is unlikely that this species would utilise temporary habitats as successfully as *R. sordidus* and *M. burtoni*. So why would *S. virginiae virginiae* and *R. leucopus* utilise a temporary habitat sucb as a cane field?

Green cane harvestingof sugarcane began in the Herbert Valley in the early 1980's increasing from 7 to 26% of the crop during 1985 (Wood 1986). Since 1985 green cane harvesting and trash blanketing practices have been widely adopted with 98.9% of all cane at the Victoria Mill and 97.6% of cane at the Macknade Mill cut green (BSES annual report 1994).

Robertson (1990) indicated that green cane harvesting, which returns crop residues to the soil surface, has a positive effect on earthworm populations. Increasing earthworm numbers under sugarcane has the potential to improve plant residue decomposition, nutrient cycling, soil aeration, soil-water infiltration, to stimulate crop growth and to increase soil aggregate strengtb (Robertson 1990). Robertson (1990) also stated that 'termites have a similar role to earthworms in the tropics and are common in Central Queensland crops grown with no tillage techniques where crop residues are left undisturbed on the soil surface'.

Robertson (et al. 1993) documented differences in invertebrate functional groups (i.e. herbivores, predators and detritivores) in zero tilled and conventional cultivated agricultural systems over 5 years. It was noted that zero tillage agro-ecosystems generally had the highest levels of detritivores and predators, while the conventionally cultivated systems had relatively low abundances of these groups. Robertson (et al. 1993) suggested that the retention of crop residues on the soil surface in zero tillage situations favours decomposer and predatory soil organisms. They found that the density of predators was correlated with the density of detritivores in zero tillage.

The ecological diversity of an agricultural system is restricted compared to native habitats which have a more complex array of species and ecological functional groups with a greater degree of trophic level interactions. In promoting the re-establishment of invertebrates, biodiversity will be increased and with it an increase in fauna predacious on invertebrates. Given that *S. virginiae virginiae* mainly eats insects, it follows that a likely explanation for the occurrence of this species in sugarcane is the increased levels of invertebrate biodiversity brought about by green cane harvesting.

R. leucopus cooktownensis individuals appeared to comprise a distinct colony within the cane field as opposed to the patchy distribution of *R sordidus* (Wilson & Whisson, 1993). Recaptures were common on successive nights indicating the colony was relatively stable at the time of sampling. *R. leucopus cooktownensis* samples were caught in a cane field with no weeds (Table 1) and therefore unsuitable for *R .sordidus* which depends on in-crop weed biomass to trigger their breeding cycle (Wilson & Whisson 1993). This may have allowed *R. leucopus cooktownensis* to colonise this cane field and establish territories. The Cape York rat is a shy and unobtrusive species (Watts & Aslin, 1981) and may not defend territory against *R. sordidus*. *R. leucopus cooktownensis* has a largely insectivorous diet with some fungi, fruit and nuts also eaten (Watts and Aslin 1981). Therefore the hypothesis that increasing the invertebrate biodiversity of the sugarcane agricultural system using green cane harvesting and trash retention techniques may provide a food source for higher order predators, may also apply for *R. leucopus cooktownensis* in sugarcane.

Until recently fauna found in sugarcane fields was poorly understood. With the exception of occasional fauna surveys (Lavery & Grimes 1976) little interest was paid to fauna in sugarcane that was not of economic significance. Incidental observations such as those described in this publication indicate that sugarcane may be a habitat for numerous species not originally thought to be of ecological significance. The registration of agricultural chemicals, whether insecticides, rodenticides or herbicides, must be evaluated for a wider range of non-target and secondary species hazards. Soil insecticides and fumigants interfere with the already disrupted biodiversity in cane fields and could result in further loss of soil fauna diversity. The benefits of a diverse soil fauna include the potential to improve plant residue decomposition, nutrient cycling, soil aeration, soil-water infiltration, to stimulate crop growth and to increase soil aggregate strength (Robertson, 1990).

Although the numbers of animals caught and the subsequent data analysis presented here are insufficient for a detailed look at the population dynamics of these two species in relation to sugarcane production, the occurrence of *R. leucopus cooktownensis* and *S. virginiae virginiae* in north Queensland sugarcane fields suggest a closer look at the interaction between changed agricultural techniques such as green cane harvesting and crop residue or trash blanket retention, and native Australian fauna is warranted. Alterations to the biodiversity of invertebrates as a result of sugarcane production may lead to populations of larger, insectivorous vertebrates such as *R. leucopus cooktownensis* and *S virginiae virginiae* being sustained in sugarcane fields.

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TABLE 1. Relative mean weed biomass in cane fields where *Rattus leucopus* were captured.

	Weed biomass index	*R. leucopus* captured
August 1994	0.0	0
	2.2	0
	0.0	11
	0.0	0
October 1994	0.0	1[illegible]
	1.2	0